

## Continuity and Inflexions of the Program of Payment for Environmental Services in Costa Rica: A Learning Process and Stakeholders' Balance of Power Perspective

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**Abstract:**

The Payment for Environmental Services Program (PESP) of Costa Rica was a pioneer program to be developed using the notion of PES. The PESP has been analyzed as a very promising innovating instrument for conservation purpose and has been considered a reference model for PES development. As such, many scholars analyzed the PESP and have discussed its efficiency. Nevertheless, the genesis and the evolution of the Program has been poorly documented from a learning process and stakeholders perspectives

In this working paper, we propose to analyze the genesis and evolution the PESP interpreting the continuity and inflexions it has experimented related to stakeholders' learning process and evolution of their balance of power.

We show that PES governance is a social construction where many stakeholders are interacting to orientate the objectives and the functioning of the PESP towards their interests and vision. We finally argue that PESP is not a mere market based instrument driven by a market coordination but an instrument driven by complex multi-stakeholder governance depending on the stakeholders' learning process and balance of power.

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## Introduction

Over the past decade, “Payments for Environmental Services” (PES) have received a great deal of attention as a natural-resource management approach (Landell-Mills and Porras, 2002; Corbera et al., 2007; Engel et al., 2008; Wunder et al., 2008; Pattanayak et al., 2010). Wunder (2005, 2007) defines PES as voluntary transactions where a well-defined environmental service (ES) (or a land-use likely to secure that service) is being “bought by a minimum of one ES buyer from a minimum of one ES provider if and only if the ES provider secures ES provision during a determined time (conditionality)”. Pure PES schemes fulfilling all the criteria of Wunders definition may not always be possible, or even preferable (Wunder, 2005; Corbera et al., 2007). More recently, scholars have analyzed the institutional nature of PES, underlining the importance of the institutional and social context in which it takes place (Muradian et al., 2010; Sommerville et al., 2009; Vatn, 2010...). They usually consider PES as a social construction, reflecting a certain distribution of power among stakeholders, while often emphasizing the need for legitimacy as an important driver of its design and evolution (Corbera et al., 2004; Pascual et al., 2010).

As a pioneer program using notion of PES, Costa Rican Payment for Environmental Services Program (PESP) has been analyzed as a very promising innovating instrument for conservation and has been considered a reference for PES schemes. Indeed, launched in 1997 in order to incentive reforestation, forest conservation and sustainable forest management, the program has channeled more than two hundred million cumulative dollars invested<sup>1</sup> (FONAFIFO, 2010), and over 700,000 ha of forest have been contracted in the program (some 13% of the national territory). Many scholars described the PESP as an innovative market based instrument for conservation (Pagiola et al. 2002; Pagiola, 2008; Rojas and Aylward, 2003), and discussed its efficiency (Daniels et al., 2010; Legrand et al., 2010b, Sanchez-Azofeifa et al., 2007; Zbinden and Lee, 2005). Nevertheless, the analyses of the PESP dynamics of evolution and governance have been poorly documented.

The objective of this working paper is to analyze the genesis and evolution of the PESP understanding the continuity and inflexions it experimented from the perspective of stakeholders' interactions.

To develop this analysis we rely on an extensive analysis of existing literature on the PESP, reviewing internal reports, decrees and manual of procedure issued by FONAFIFO. We also developed interviews of stakeholders directly involved in the genesis, evolution and management of the PESP as well as representative of stakeholders' involved in the management of forest plot (producers, environmentalists,...). These stakeholders were invited to present their own trajectory, to describe their role played in the emergence and evolution of the PESP, as well as their perception about PESP from the emergence up to now. The interviews were recorded and each transcribed. We derived from this transcription of the individual interviews the key moment in the PESP adoption and evolution, as well as the perception and strategy of their interests groups.

In this chapter, we firstly describe the basic features of PESP as it has been design and implemented at its initial stage following the 4<sup>th</sup> forestry law of 1996, and analyze this basic features as the results of interaction between stakeholders' groups involved in forest issues. In the second part, we describe the evolution of the key features of PESP on the period 1997-2010, and analyze these evolutions in the light of the evolution of the balance of resources of stakeholders' groups.

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<sup>1</sup> This reference corresponds to data available on FONAFIFO website : [http://www.fonafifo.go.cr/paginas\\_espanol/servicios\\_ambientales/sa\\_estadisticas.htm](http://www.fonafifo.go.cr/paginas_espanol/servicios_ambientales/sa_estadisticas.htm)

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## 1 – The basic features of PESP

Aiming at facing deforestation and improving the country's forest cover, the PESP has been instituted by the 4<sup>th</sup> Costa Rican forestry law (# 7575) adopted in April 1996. It has been built on the experience of the exiting schemes of “forest incentives”<sup>2</sup> of which it inherited many of its main features (Daniels et al., 2010; Legrand et al., 2010a; Pagiola et al., 2008).

### 1.1. The core principles of PESP

The core principle of PESP is to compensate the forest private landowners for the environmental services (ES) generated by their forests (figure 1). The basic elements that set the ground for the implementation of PESP were defined in the law 7575 which recognizes and defines the ES provision by forest and forest plantation, a fund managing body (FONAFIFO) and a primary source of funding.

#### a- The functioning of the scheme

The law 7575 of 1996 made National Fund for Forest Financing (“*Fondo Nacional de Financiamiento Forestal*” - FONAFIFO), a public non-governmental trust fund, responsible for researching and managing of funds to finance the PESP. It defines that a third of the existing hydrocarbon tax will be channeled to the FONAFIFO to pay for forest private owners' environmental services.

Following market based principles, the forest landowners cede their rights on their forest ES to Fonfafifo that sells them to end beneficiaries (for example hydroelectric companies or breweries for water services or through the carbon market, see figure 1). A formal contract is established between FONAFIFO and forest landowner to set the transaction. This contract is conditioned to the existence of a forest management plan with which the forest owners are committed to comply. This management plan is issued by a forestry regent<sup>3</sup>, contracted by the forest owners, and who is in charge of monitoring the compliance of the PES contract, acting as third party control of PES contract between Forest owner and FONAFIFO.

At the beginning of the program, while FONAFIFO has the responsibility of the financial management of the program, most of the operational management (selection and contracting) was carried on by the National System of Conservation Areas (“*Sistema Nacional de Area de Conservacion*” - SINAC<sup>4</sup>).

During the first years of the program, no prioritization of the applications was made: they were selected on the principle “first in – first contracted”. The conditions of access were similar to the ones defined in the previous existing instruments. The applicants were asked to present a management plan and to have formal land property rights. For the payments to be done, the contractual obligations of the PESP participants need to figure in the land tenure

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<sup>2</sup> These forest incentives (“*incentivos forestales*”) schemes started in late 70's and aimed at fostering reforestation (Income tax credit, Forest payment certificate – “*Certificado de abono forestal*” – CAF, and Advanced Forest payment certificate – “*Certificado de Abono Forestal por Adelantado*” – CAFA schemes), forest payment certificate for management (“*Certificado de Abono Forestal por Manejo de Bosque* - CAFMA scheme) and forest protection certificate (*Certificado de Proteccion del Bosque* - CPB) – (Daniels et al., 2010).

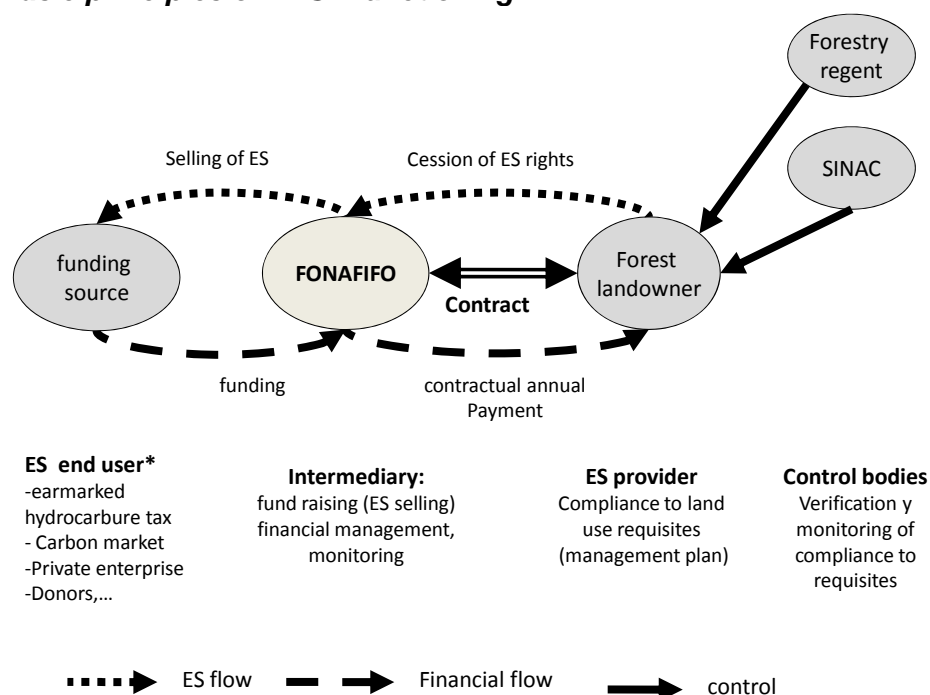
<sup>3</sup> The forestry regent (“*regent forestal*”) is a formal body created by the forestry law 7575. They are licensed forester, which has the public power (“*fe publica*”) of authenticate the management plan of private landowners. They are accredited by the Agronomist College (“*colegio de agronomos*”), which is in charge of the monitoring and control of forestry regent activities.

<sup>4</sup> According to the biodiversity law (1998), the SINAC is an institutional system of decentralized and participative management that integrates the skills of the Ministry of the environment (MINAE) in terms of forestry, wildlife and wildlife protected areas in order to dictate the policies, plan and implement processes aiming at the sustainability of natural resources management of Costa Rica. The SINAC is made of 11 sub-systems called conservation areas and a central office. (<http://www.sinac.go.cr/informacion.php>)



registry, so that the contract applies to future owners in case the lands are sold. At the beginning of the program, the payments were done through “forest payment certificates”, monetary titles that can be used for any payments.

**Figure 1 : Basic principles of PESP functioning**



Source: authors derived from interviews to FONAFIFO administrative

## b- Environmental services and modalities

The law # 7575 defines the environmental services as « *those that offer forest and forest plantations and that have an impact on protection and improvement of the environment* ». It recognizes four environmental services: greenhouse gas emissions mitigation, water protection, biodiversity protection and scenic beauty.

When the PESP began in 1997, three modalities of PES were defined in line with existing forest incentives schemes: a PES for forest conservation (former CPB), a PES for forest management (former CAFMA), and a PES for reforestation (that covers former CAF and CAFA) - (Le Coq et al., 2010a). For each modality a payment level per hectares of land was defined. In 1997, the payments levels were 227 \$US. Ha<sup>-1</sup> for forest protection modality<sup>5</sup>, 365 \$US Ha<sup>-1</sup> for forest management modality and 545 \$US Ha<sup>-1</sup> for reforestation modality, for the whole duration of the contracts, that is to say respectively some 5, 5 and 8 years<sup>6</sup>. These amounts were set to correspond to the minimum acceptable by the land owner to cover the cost of reforestation (PES reforestation) or sustainable management practices (PES management), or to cover minimal cost of opportunity of forest conservation (PES protection)<sup>7</sup>.

<sup>5</sup> The exchange rate used is the one at 12/31/2006.

<sup>6</sup> The beneficiaries' obligations can last more time (20 years for forest protection, 15 years for reforestation).

<sup>7</sup> The level of 227 \$US of conservation PES in 1997, which correspond to 45.4 ha<sup>-1</sup> year<sup>-1</sup> is more or less the opportunity cost of extension cattle raising, which was one of the major alternative of forestry in the 60-90s (Legrand et al., 2010a); it also a mode level of the different evaluation of potential annual cost for the 4 services, and the market local cost of renting an hectare of pasture (Castro et al., 2000)

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### **c- The PESP governance bodies and texts**

FONAFIFO's board is in charge of defining the main strategic options and validating the financial management. According to the law # 7575, its board is composed by a) 2 representatives of private sector nominated by the National Forestry office ("ONF") including one representative of small and medium forestry producers and one representative of the industrial sector, and b) 3 representatives of public sector including one representative of the ministry of environment (MINAET), one representative of the Ministry of Agriculture (MAG) and one representative of the national banking system.

The implementation of PESP is driven by two main legal instruments that are annually updated: 1) an annual decree, signed by the Ministry of Environment, which defines the eligible PES modalities and the total budget allocation for each of them, and 2) a manual of procedure, that defines the conditions of access to PES, the requisites, the priority criteria's and administrative rules. A new version of these documents are prepared each year by FONAFIFO's executive management that are submitted for commentaries to three main actors: the SINAC representing the administration in charge of environmental agenda, the ONF representing forestry private sector, and the college of agronomist that supervise the forestry regents activities. After consultation, the decree and manual of procedure are finally approved by FONAFIFO's board, signed by the Ministry of Environment.

### **1.2. The genesis of the PESP and stakeholders' role**

If PESP is a new program, its genesis is embedded in a long history of policy instrument to face deforestation issue (Daniels et al., 2010; Le Coq et al, 2010a, 2010b), where several stakeholders were involved. We analyze here the context of the genesis of the PESP and the vision, interests, resources and organization of the stakeholders involved in forest issues.

#### **a- The PESP context of formulation**

In the early 90<sup>th</sup> a third forestry law had been voted by the legislative assembly and rejected by the constitutional court. Thus, a process of formulation of reform of the forestry law was then in the policy agenda since 1990. In 1992, due to opposition between the ministry of agriculture and ministry of environment, the reformulation process of the forestry law was stopped. Although several instruments to promote reforestation, sustainable management and conservation of forest existed, the forest cover was reaching a very low level<sup>8</sup>. In the 1994, the newly elected president, José María Figueres Olsen, who had put sustainable development as one of its political priority, reactivated the process of reformulation of the forestry law, leading to the setting of a policy window (Le Coq et al., submitted). In mid 1990, when the project for a new forestry law was designed, various elements of context were changing. Firstly, since the late 80's Costa Rica was facing a severe budget crisis and the support to forestry sector through direct budget allocation (called "forest incentives") became more and more difficult to obtain. With the signature of an agreement between Costa Rican Ministry of Economy and the International Monetary Fund, existing "forest incentives", were considered as subsidies and banished, leading to the necessity to reformulate the instruments to support forest sector. Secondly, since the international forum of Rio in 1992, the role of forest in the Climate change and biodiversity conservation issue was emphasized; the opportunity to fund forest conservation through possible carbon compensation mechanism was rising. Finally, in this context of constraints and opportunities, the necessity to reform the law to better face deforestation problem, promote forest conservation and define new forms of supporting sector appears as a stringent necessity (Legrand et al., 2010a; Le Coq et al., 2010a).

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<sup>8</sup> Costa Rica had 75% of its area of forest in 1940, and a mere 21 % in 1987 (FONAFIFO, 2005).



## b- The stakeholders' interest groups around forest issue

Three main groups of stakeholders can be identified that differ in term of vision, interests and positions about forestry problem and forestry policy orientation (figure 2): 1) the representative of agricultural sectors, which in the 80-90s were basically considering the forest as an empty, "unproductive" space; 2) the representative of forest sector that consider the forest as a "productive" space and provider of primary material (Wood) for the industry, and 3) the environmental groups representatives that consider mainly forest as a habitat to be protected to maintain plants and animals biodiversity (Le Coq et al., 2010b).

**Figure 1 : Vision and interests of stakeholders' groups in 1994-1996**

sectors	Agricultural		Forestry		Environmental
Stakeholders' groups	Large agricultural (business) farmers	Small holder farmers (peasant)	Small forestry farmer	Large forestry entrepreneurs, wood industrial	Environmentalists and ecologists
Leading professional representatives	CNA, Laica	MNC*, Upa Nacional	Junaforca	CCF	FECON
Public institutions	Ministry of Agriculture and animal husbandry		Ministry of Environment DGF SINAC		
Main Forest vision	Forest as an empty space « unproductive space »		Forest as a provider of good (and services – especially Carbon sequestration)		Forest as support of biodiversity
Main interests on forest issue	Maintain land use extension for agricultural purpose	Develop agricultural production and forestry (agro forestry)	Sustain forestry activity (community management for income generation)	Sustain forestry activity (wood production for industry)	Maintain biodiversity and natural ecosystem
Involvement in the formulation of forestry law	Very low	Low	Fair	High	Low
Position regarding Recognition of SE provision by forest	-	Positive	Positive	Positive	Positive
PES mechanism	-	Positive	Positive	Positive	Positive
Priority PESP modalities	-	Favorable to Agro-forestry	Favorable to management, reforestation, conservation, and Agro Forestry	Favorable to management, reforestation, and conservation	favorable to conservation, opposed to management
Ban of land use change	Not favorable		Favorable if compensations		Favorable

NB: - = no data ; \* = MNC : Mesa Nacional Campesina

Source: Based on stakeholders' interviews 2008-2010

In the mid 1990, when the forestry law 7575 was formulated and set the ground to the PESP, these three groups of stakeholders was in asymmetric situations in terms of involvement and political resources (figure 3). Whereas agricultural sector was a major force in the country until the 90's, the agricultural sector was facing many difficulties at the beginning of the 90's with a structural adjustment plan that affected strongly agricultural institutions, and led to strong division at syndicate levels between small farmers' movement and large farmers. Indeed, in the 94-96 periods the agricultural sector representative was poorly represented in the forestry law formulation process (Morilhat, 2011). Whereas national environmental

consciousness and the number of environmentalist organizations was rising in the early 1990s (Steinberg, 2001), the environmental representatives groups as newly created FECON were formally poorly represented in the formulation process (Morilhat, 2011). However, two law proposals reforms were proposed by deputies that cope with environmentalist and ecosystemic vision were proposed in 1994 and 1995<sup>9</sup>.

**Figure 3: Involvement and policy resources of stakeholders' groups during the formulation of the 4<sup>th</sup> forestry law in 1994-1996**

sectors	Agricultural		Forestry		Environmental
	Large agricultural (business) farmers	Small holder farmers (peasant)	Small forestry farmer	Large forestry entrepreneurs, wood industrial	Environmentalists and ecologists
Involvement in the formulation of forestry law	Very low	Low	Fair	High	Low
Institutional Resources	Strong alliance with MAG	Low conflict with MAG	Conflicting alliance with Ministry of Environment	Strong alliance with Ministry of Environment	Conflicting alliance with SINAC
Organizational resources	Strong but low mobilization	Fair (atomization en various movement)	Good (representation JUNAFORCA including grassroots organizations)	Strong (representation of CCF including with grassroots organization)	Fair (a leading organization FECON)
Political resources	Strong	Low	Low	Strong Majority fraction of PLN*	Limited (majority fraction of PLN*)
Technical resources	Good (but agronomists)	Limited	Limited	Strong with Academic support (Ecological Economics) and Agronomist college (including forestry engineer)	Academic support from biologist from university and biologic college
Public opinion	Not favorable (large scale agriculture affects natural resources)	Favorable (Small farmers doesn't affects natural resources)	Favorable (traditional Forest as provider of services)	Mitigate ("wood cuter"/ forest provider of services)	Very favorable (forest as a natural resource, biodiversity)
Financial resources	Important (but not oriented toward theme)	Limited (Support from NGO)	Limited (Support from international NGO)	Important (support from major funding agency -USAID, GTZ)	Fair (Support from international NGO)

NB: \* PLN National liberation party (*Partido de liberacion nacional*)

Source: Based on stakeholders' interviews 2008-2010

In the mid 1990, the main group of stakeholders that was mobilized and was strongly empowering the discussion around the formulation of the policy was the forestry one (figure 3). This groups was composed of local forestry organizations that have been developed in the 80s in all the regions of Costa Rica, as well as national representative organizations that were in mid 90s federated in a national platform, the Costa Rican Forestry Chamber (*Camara Costaricense Forestal - CCF*), which counted with the representation of large private forestry entrepreneurs and wood industrials as well as representative of Small

<sup>9</sup> The first one, called cut only what has been planted (CULPA - "*cortar unicamente lo que se ha plantado*") was presented in July 1994 by a depute of the party of liberation national (PLN), Otton Solis; another proposal was proposed in February 1995 by another the depute of PLN, Luis Martinez (Morilhat, 2011, Le Coq et al., submitted)

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forestry producers regrouped in the National Assembly of Forestry Peasant (*Junta Nacional Forestal Campesina* - Junaforca) and which counted the support from international cooperation (Le Coq et al., 2010a). Aside the organization of the private forestry sector, public forestry administration has been strengthened with the creation in 1990 of the General Direction of Forestry within the Ministry of Environment. Whereas some differences of vision were existing inside the forestry stakeholders' group, especially between small forestry and large enterprise representatives, a common vision emerged around the necessity to maintain forestry support instruments (and give continuity to existing support instrument), and to consider forest area for both the products (wood) and the services that the forest can provide to the society (especially carbon), services that can provide a new form of justifying the support to the forest sector through a PES scheme.

### **c- The basic principle as the reflect of a compromise leaded by forestry sector stakeholders**

The basic principle of the PESP set in the law 7575 reflected of compromise leaded by forestry sector stakeholders. The process of formulation of the law leading to the emergence of the PESP led to an opposition between the different stakeholders and interests' groups<sup>10</sup>.

Three projects of law were introduced in the parliamentary depute committee in charge of formulating the law, the committee for agriculture and natural resource affairs (CPAARN): one was proposed by the Ministry of Environment, René Castro, developed through consultation with CCF and forestry stakeholders, another developed by the depute Otton solis, entitled CULPA, and a third by the president of the CPAARN, Luis Martinez. The first one reflected a compromise inside the stakeholders of forestry sectors (between public and private representatives), the second and the third one, was in line with environmentalist vision, arguing for a prohibition of forest exploitation, and tending to orient the instrument toward the conservation of forest (Morilhat, 2011, Legrand et al. 2010a). A subcommittee was formed to make a synthesis text of these 3 versions, which was discussed and approved in commission in late 1995. The introduction of the PES principles emerges in the final version of the text in early 1996 (Morilhat, 2011), and was then quickly adopted by the assembly in February 1996 under the pressure of the risk to see a pure disappearance of existing mechanism of support to forest sector according to the agreement between FMI and Costa Rican ministry of economy and thanks to the ability of two policy entrepreneurs, Rene Castro and Luis Martinez (Le Coq et al., submitted).

The initial governance and functioning of PESP that is set in the forestry law reflects a compromise between diverse positions and interests of stakeholders concerned by the deforestation problem. By the way, the principle of recognition of ES provided by the forest, and the principle of PESP was not thoroughly discussed, but it represents a tacit consensus between the forestry and environmental stakeholders. For the forestry stakeholders, it was a way to justify the continuity of the support to forestry activities; for the environmental representative, it was a way to introduce the ecosystemic concern in the forestry policies (Le Coq et al., submitted). The prohibition of land use change was the main point initial of disagreement for some stakeholders' of the forestry sector since it was considered by them as an infringement to the liberty of use rights of private propriety. Nevertheless, it became acceptable for them because 1) they were conscious of the risk of wood shortage for wood industry if the forest resources were still decreasing more, 2) the prohibition of land use change was linked with the possibility to appeal to public forces to protect invasion of forest area by producers, which is a way to reinforce property right against squatters, 3) a clear financial compensation principle was set in the law to compensate the restriction of their land use right through PES mechanism.

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<sup>10</sup> For more detail on the policy process, see Le Coq et al. (submitted); Morilhat (2011).

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Finally, the basic governance of PESP reflects the interests of the forestry stakeholders. First, the definition of forest include regenerated forest or plantation, and the PESP modalities include reforestation and also forest management (that enables extraction of wood), that were questioned by the environmentalists stakeholders. Second, the laws assign the management of the PESP to a forestry institution (FONAFIFO), which governance rule (board composition) is favorable to forests stakeholders since its board is composed by representatives nominated by the newly created national forestry office (ONF)<sup>11</sup>. Third, the control of the execution of the management plan, that is a conditionality of PES contract, was given to forestry regent, that are private forestry engineers<sup>12</sup>.

## 2- The evolution of PESP

The different key elements of the functioning of the PESP have evolved overtime between 1997 and 2011. We firstly describe these key changes and then we analyze this change in light of the balance of resources and power of the different stakeholders' groups.

### 2.1. The evolution of the PESP features

The evolution of PESP can be grasped through three elements: 1) the funding sources, 2) the payment features including the type of eligible modalities, the levels of payments and prioritization of payments, 3) the management structure and rules.

#### a- The consolidation and diversification of funding resources

Consolidation of the funding resources is a main issue for PESP sustainability. Since its creation, the sources of funding of the program have been increasing and diversifying overtime (figure 4), in a way that reflects partially the intent to make the ES users finance the program.

The first issue was to ensure the payment of the fuel tax that was set in the law # 7575 as the basic funding system of the PESP. In 1997 and 1998, the Ministry of Finance resisted its obligation to pay FONAFIFO one third of the amount raised by this tax (Government of Costa-Rica, 1998). With the help of the Ministry of the Environment, the forestry sector fought and reached an agreement with the Ministry of Finance to secure the financing of the program when was discussed the law of tax simplification in 2001. According to this law, a unique hydrocarbon tax was created of which 3,5% was clearly earmarked for the FONAFIFO to fund the PESP, leading to a consolidation of the PESP funding. Thus, even the negotiated level has been set to one third of the amount stated in the forest law, the financing from the fuel tax increased when the fuel tax scheme changed. Finally, fuel tax is still the most important and consolidated source of funding of the PESP for the 1997-2010 period (Legrand et al., 2010a).

The efforts to take advantage global carbon market, which was supposed initially to become one of the main funding sources of the program, has resulted quiet disappointing until now. While the government of Norway signed a 2 million US\$ contract in 1997, which was considered a pioneer carbon deal, no other funding has been raised through the carbon market, as the rule of Clean Development Mechanisms and Kyoto protocol defined after the launching of Costa Rican PESP do not permitted Costa Rican PES to be eligible.

Thus, FONAFIFO administration has also tends to diversify the PESP funding sources. Since 1998, voluntary private agreements with the national private sector (hydropower and water companies, breweries...) for the funding of the PESP have been promoted rapidly. Further,

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<sup>11</sup> The national forestry office (ONF) is also created by the law 7575 as a rector agency leaded by forestry organization to propose policy (Barantes, 2009).

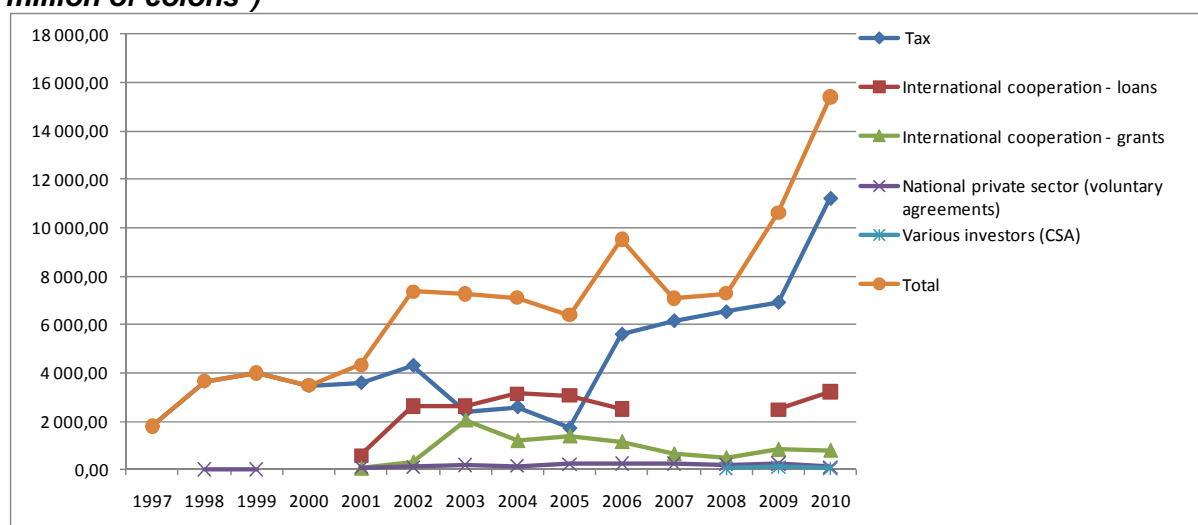
<sup>12</sup> Article 21 of the law 7575.

the “ES certificate”<sup>13</sup> was created in 2001. It targets private investors willing to invest in ES generation, especially for carbon offset. If the numbers of contract has been quickly raised, the funding source through of private enterprise still limited (figure 4).

To maintain and extend PESP scope, additional funding resources were sought from international donors. Since 2001, international cooperation has contributed in a significant way to the funding of the PESP. The World Bank and the Global Environment Facility (GEF) have supported FONAFIFO with respectively a 40 million US\$ loan and a 5 million US\$ grant in the framework of the Ecomarkets project<sup>14</sup>. The loan substituted itself to the government obligation to channel a part of the amount raised through the hydrocarbon tax and did not bring additional resources to the program. This was not the case of the funding raised through the MMBIEM project, the following of the Ecomarkets project, for the 2008-2012 period. It consists of a 40 million US\$ loan from World Bank and a 10 million US\$ grant from GEF, a major part of which has been channeled through the “Biodiversity Conservation Trust Fund”, that was been created in 2006 to “serve as the repository of other grants, and of income from sales of conservation certificates in the voluntary market” (Pagiola, 2008). Furthermore, a 10 million Euros agreement with KfW, from the German cooperation, was reached in 2003 for the funding of the program.

Finally, since 2005, according to the reform of the water fee on water use, an obligation to channel one fourth of the amount raised to the PESP, this additional resources justified by hydraulic services contribution of forest raise new opportunity of funding. Nowadays, it still limited since this tax will be gradually be put in place in the following years, but may represent an important amount of additional resources.

**Figure 4: Amount and origin of funding resources of PESP from 1997 to 2010 (in million of colons\*)**



Source: FONAFIFO

\* : 1 euro = 684 colones en december 2010

## b- Modification and diversification of PES payment

The payment structure has evolved over time, regarding eligible modalities of PES, the amounts of payment by modality, the targeting of the payment and the differentiation of the payment.

<sup>13</sup> « Certificado de Servicio Ambiental (CSA) »

<sup>14</sup> The Ecomarkets (« Ecomercados » in spanish) project has been funded by the GEF, the World Bank and the Government of Costa Rica for the 2001-2005 period. This project of 62 millions USD aimed to strengthen and expand the PESP (Hartshorn and al. 2005).

**Evolution of eligible modalities.** Three main changes in the PESP modalities occurred in the last 15 years (figure 5): 1) the suppression from 2002 to 2009 of the forest management PES modality, 2) the inclusion of the agro forestry systems PES modality since 2003 and 3) the inclusion of the natural regeneration modality PES since 2006.

**Figure 5 : Evolution of modality and level of payment of PES from 1997 to 2010**

year	forest protection				Re-forestation	mana- gement	established plantation	AFS	natural regeneration		
	(colones o \$US* ha <sup>-1</sup> )				(colones o \$US* ha <sup>-1</sup> )	(colones o \$US* ha <sup>-1</sup> )	(colones o \$US* ha <sup>-1</sup> )	(colones o \$US* trees <sup>1</sup> )	( \$US* ha <sup>-1</sup> )	( \$US* ha <sup>-1</sup> )	( \$US* ha <sup>-1</sup> )
1997	50000				120000	80225	-	-	-		
1998	60000				154000	94000	60000	-	-		
1999	60000				154000	94000	60000	-	-		
2000	66000				169000	-	-	-	-		
2001	72600				185900	113300	-	-	-		
2002	79160				202700	123540	-	-	-		
2003	87100				223000	-	87100	320	-		
2004	95800				245000	-	-	320	-		
2005	320				816	-	-	1,3	-	-	
2006	320				816	-	-	1,3	816	205	
2007	320				816	-	-	1,3	816	205	
2008	320				816	-	-	1,3	816	205	
		in forest protection area	for hydraulic ressources	in conservation gap"							on pasture (kyoto)
2009	320	320	400	375	980		-	1,3	205	205	320
2010	320	320	400	375	980	250		1,3	205	205	320

Source : FONAFIFO

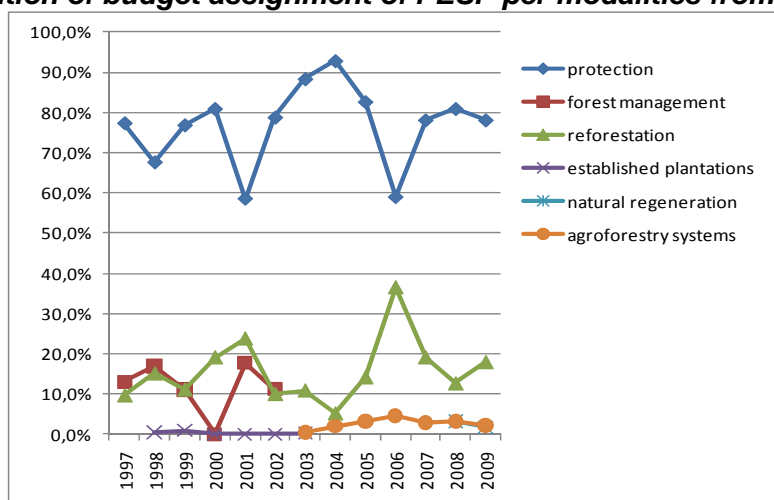
**Evolution of payment level.** The evolution of the payments has been marked by a substantial increase of the level of the payments and the dollarization of the payments, both obtained in 2005 (figure 5). The levels of payment went respectively from 234 US\$ ha<sup>-1</sup> to 320 US\$ ha<sup>-1</sup> for the forest protection modality, from 599 USD/ha to 816 USD/ha for the reforestation modality and from 0,86 USD/tree to 1,3 USD/tree<sup>15</sup>. The reforestation modality has been made more profitable later on by raising the level of payment to 980 US\$ ha<sup>-1</sup> in 2009 and by reducing the duration of the contract from 10 to 5 years between 2008 and 2009 while the level of payment remained the same.

**Regarding evolution of the priority,** with the change from existing policy to PESP policy, the majority of funds have evolved given more room to forest conservation orientation that represent an average of 70% of the resource allocation of PESP over the 1997 – 2010 period. The distribution of the funds among the different modalities shows then the prevalence of the forest protection modality during the whole period of time (figure 6).

15 Amounts in 2004 that were in local currency (« colones ») have been converted in USD using exchange rate at 12/31/2003.



**Figure 6: Evolution of budget assignment of PESP per modalities from 1997 to 2009**



Source : FONAFIFO<sup>16</sup>

**Condition of access.** Some measures have been taken to ease the participation of small landholders since the first years of the program. In 1998, a system of collective contract, that allow some small landholders to apply together to the PESP has been created in order to lower the transaction costs assumed by the land owner to contract a forestry regent and make the application forms. This practice was abandoned in 2002, since it has the drawbacks of creating additional delays due to heterogeneity of situation of farmers<sup>17</sup>. Nevertheless, to facilitate access to small landowners, a quota has been attributed to local forestry organizations that facilitate the preparation of the application of small land owners. Furthermore, to enables small landowners that did not have registered land title to access which is a major impediments of numerous small holders in Costa Rica, the requirement of formal land tenure rights for the participation to the PESP was abolished in 2002.

**Targeting of payment.** At the beginning of the program, the basic principle was “first in time, first in rights”. The demand of PES was analyzed according to the moment and order of reception at FONAFIFO office. Progressively, some criteria have been defined to prioritize applications to the PESP in order to target the most important lands for ES provision (mainly water and biodiversity services). Thus, a system of prioritization of the demand was put in place since 2002. The applications are prioritized according to their locations, giving priority to private land inside national parks and biologic corridor defined by GRUAS I mapping, a proposal of land uses planning for biodiversity conservation that served as a basis for the definition of PESP priority areas. In 2004, a social criterion was also aggregated that gives priority to the forest owner located in districts of low development index.

**Differentiation of payment.** At the beginning of the program the level of payment was equal for each modality whatever location of the land (and ES provision of this land). Since 2009, a differentiation of level payment has been initiated for conservation PES contracts to tends to differentiate according to ES provision. Thus, an additional payment of 80 US\$ ha<sup>-1</sup> is given for the PES protection contract for the land that have an interest to maintain hydrological services, and a 55 \$US ha<sup>-1</sup> additional payment is given for land located in critical zones for biodiversity according Gruas II and located outside parks and existing corridors (figure 5). By the way, for the natural regeneration PES modality, the land that may be eligible to funding through Kyoto protocol can receive an additional payment of 115 US\$ ha<sup>-1</sup> compared with classical natural regeneration contracts (figure 5).

<sup>16</sup> For the years 2006 and 2007, the amounts contracted for the modality natural regeneration are included in the amount of the reforestation modality.

<sup>17</sup> As the application was collective, the payment was done only when all the forests owners of the groups were complying with all the requisites. Thus, it was current that, because of some farmers were not complying with some requisites, the other were not receiving payments even if they individually comply with the requisites.

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### c- Evolution of PESP management

Since its creation, the management of PESP has evolved regarding: 1) the operational processes (administrative procedure of application), and 2) regarding the institutional structure (control and monitoring functions). The operational processes of the PESP has experimented various changes. First, in order to reduce applications costs for conservation PES, the management plan required has been simplified. The *ex ante* control of application regarding administrative requisites has been also simplified; the control of contracts has been optimized through a system of Geographic Information System facilitating the constant monitoring of the program, and the control of the effect of the program on land uses. The program has also evolved towards the facilitation of the payment methods to the beneficiary. At the beginning of the program, the payment to landowners was done through certificates (value checks), before being done through bank checks in 2002. In 2005, the payment for ES has been facilitated through direct deposit in landowner's bank account which reduces time and cost of management for both FONAFIFO and the landowners.

The institutional structure of the program has experimented two major changes since 1997: 1) the attribution of the integral administrative management of PESP to FONAFIFO since 2003, and 2) the change of status of FONAFIFO since 2008.

At the beginning of the program, the implementation of the program was shared between SINAC and FONAFIFO, the SINAC was in charge of receiving the application, analyzing the application and checking the compliance of criteria according to the manual of procedure, and even prioritizing the application according to its own local criteria. FONAFIFO was in charge of the final decision, and the payment procedure. In 2002, the management and responsibility between SINAC and FONAFIFO was reformed. The FONAFIFO took then the control of all the procedure from application reception to payment procedure, and the responsibility of the SINAC was concentrated to its genuine mission of deforestation control. This change enables a better control of the process of prioritization of the demands according to FONAFIFO objectives and strategy. This transfer of responsibility led also FONAFIFO to develop its own regional office in 2003<sup>18</sup>. As FONAFIFO did not received additional financial resources for assuming these new responsibilities, it led to the raise of the FONAFIFO operating costs due to an increase of its employees, which rise from some 15 persons in 1998 to some 35 persons in 2005.

Secondly, following a decision from the general control body of the republic, FONAFIFO became a public entity in 2008. This lead to a further very important increase of its staff (from 52 up to 100 employees between 2008 and 2010) in order to comply with the legal obligations (especially internal control and employee status) to which such an entity is subject. This has also raised dramatically operating cost of FONAFIFO from 12% of activities to some 20 % of the budget (Legrand et al., 2010a). This additional cost is born by the FONAFIFO on the financial resources they collect.

The analysis of the evolution of PESP shows a continuity and consolidation of the program especially regarding funding sources and management practices, but also some adjustments and adjustment in the orientation of the PESP regarding types of modalities, targeting and differentiation of payment. In the following part, we analyze the reasons of these evolutions from a stakeholder's perspective.

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<sup>18</sup> In 2003, seven regional offices of FONAFIFO were created. Two additional offices were created in 2004 and 2005 by splitting existing offices to facilitate management. Nowadays, FONAFIFO has 9 regional offices covering all the country. To reduce the cost, these offices are generally located in the regional building of the SINAC.

## 2.2. The PESP evolution, balance of power and learning process of stakeholders

The evolution of the PESP can be interpreted as the result of a learning process and the evolution of the balance of power between stakeholders involved in the forest issue. We can define 3 main periods where the balance of power among stakeholders changed and led to substantial changes in the PESP (figure 7).

**Figure 7 : Key Changes in PESP according to stakeholders' interests (1997-2010)**

	1997-2001	2002-2006	2006-2010
Forestry sector stakeholders' interests	1998-1999: inclusion of "established plantation" modality 2001-2002: Reactivation of "forest management" modality	2003: reintroduction for "established plantation" modality	2009/2010 : reevaluation of amount of "reforestation" modality 2010: reactivation of "forest management" modality
Environmental stakeholders' interests	2001: consolidation of earmarked funding to FONAFIFO (fuel tax reform)	2003 : consolidation of the responsibilities of FONAFIFO in PESP management	2009: creation of "natural regeneration" modality and differentiation of payment according to water ES
Agricultural sector stakeholders' interests	2000: administrative suppression of " forest management" modality	2003 : suppression of PES for forest management 2004: suppression of PES for "established plantation" 2003: priority setting to biologic corridor	2009 : differentiation of PES payment according to biodiversity ES 2006: creation of a fund for biodiversity
		2003 : priority setting to low poverty index	
		2003: inclusion of SAF modality	2011 : negotiation of a new modality for SAF café

Source: Stakeholders' interviews 2009-2010

### a- 1997-2001: the consolidation of PESP oriented by the forestry stakeholders

During this first phase, the power of the forestry sector productive groups was still important in the orientation of the PESP. During the second half of 1990s, the CCF still maintain and strengthen its power, enlarging its memberships to reach 152 affiliates in 1999 and developing services to their members. In the same time, the ONF was creating. During this period, the PESP still basically in the continuity of the existing forestry incentive instrument; the modalities are those of existing instruments according to vision of these stakeholders. Using its leadership in the governance of the PESP, an additional modality was even created in 1998 and 1999 in line with the interest of forest productive groups of interest: the PES for established plantation (figure 7).

Although few stakeholders knew about the concept of SE and PSE when the law # 7575 was formulated and adopted, with the beginning of the implementation of the PESP, the knowledge for the stakeholders of various groups experimented begun to increase. In 1998, a newly elected president, Miguel Angel Rodriguez, following the advice of the vice minister of environment, Carlos Manuel Rodriguez, organized a large process of national consultation on the PESP to inform and to raise awareness of stakeholders on the program. This extensive and large consultation<sup>19</sup> led to question the PESP on many points such as the enlargement of the scope of the PES to all activities that provide ES (out of forest which is its main original purpose). A project of law was developed to enlarge the spectrum of PESP including new ecosystems. The idea of a creation of a bank of environment, where all the payment could be concentrated on for any ES providers, was proposed. Nevertheless this

<sup>19</sup> In 1998-1999, a national workshop was organized and 3 regional workshops. In these workshops, the participation was large including the various ministries, representatives of private industrial sector, of environmentalists' groups, of universities, and public enterprises of water distribution and energy production.

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project of law appears too ambitious and difficult to put in practice because, on one side, all the sector was claiming for funds as ES providers (including banana, coffee sector,...) and, on the other side, the ES users (such as public water distributor, and energy producers) was not ready to pay as ES users. In this condition, the project was abandoned. But this process led to broadcast information and enlarge appropriation of the meaning of the concept of PES among the agricultural and environmental stakeholders. It also raises the attention on the necessity to secure the funding source of PESP and diversify it. In line with this appropriation, some first contracts were signed with some private enterprises to fund the PES system.

With the beginning of the PESP implementation, environmentalist stakeholders began to pay more attention its effects PESP. In the 1998, a multidisciplinary group with environmental vision made an analysis of the management plan in the Osa region, an hot spot of biodiversity of Costa Rica. This study showed the evidence mismanagement of the modality of PES for forest management. They develop a mass media campaign against these practices. Under the pressure of environmentalist groups, an administrative ban was declared in 2000 by the ministry of environment to stop “forest management” and “established plantation” PES modalities.

In spite of the risk of enlargement and dilution of the PES concept to other sector and the tension on the “forest management” and “established plantation” modality, the PESP gained its legitimacy since the demand from final beneficiary was important, especially for conservation modality. In this context, thanks to their mobilization, the forestry sector stakeholders achieved to secure and better schedule the fund from hydrocarbon tax to FONAFIFO. Indeed, the law # 7575 specified that 1/3 of hydrocarbon tax will be to dedicated to compensation forest owner, but not especially dedicated to FONAFIFO, with the negotiation of the reform of tax system (*Ley de Simplificación y Eficiencia Tributarias*, Nº 8114 of 2001-2000), forestry sector achieved to secure the tax to a level of 3.5 % of unique tax on hydrocarbon<sup>20</sup> and to earmarked to FONAFIFO (as unique seller of ES).

#### **b- 2002-2006: an inflexion toward environment and social purposes scheduled by environmentalists stakeholders and international influence**

The year 2002-2003 is marked by a change in balance of power between the different groups around forest issue that led to some changes in the PESP orientations toward a focus on environmental and social objectives and more oriented toward the interests of agriculture, small forest holders, and environmentalist's stakeholders.

From 2002, the interests groups supporting a productive vision of forest experienced a reduction of their power. Three factors led to this reduction (figure 8). Firstly, the CCF that has been the main organized representative force of private forestry sector began to fade. In 1999, with the change of leading representatives of the CCF, the dialogue climate between the different tendencies represented in the CCF (large forestry enterprise, wood industry sector, small and medium forestry producers) began to change. And in the early 2000s, CCF experienced a rapid disaffiliation and reduction of its means. The small and medium forestry representatives (Junaforca) split from CCF, which concentrates then only a large forestry and industrial sectors. Secondly, the ONF that was supposed to represent the private sector, face financial difficulties, and was not able to counterbalance the reduction of strength of the CCF. Thirdly, the local forestry organizations begun to suffer from the reduction of the direct support they had in the 90s (Barrantes, 2009).

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<sup>20</sup> During the negotiation, the ministry of economy proposed a fix amount, but the forest stakeholders achieved to obtain a 3.5 % of the hydrocarbon tax, which has enable to raise more fund since the increase of fuel price during the early 2000.

At the same time, stakeholders oriented toward a more environmental/conservation or social visions gained forces. Three factors enable them to gain forces (figure 8): 1) the raising influence of the international donors, 2) the change in policy leaders, and 3) the mobilization of specific subsectors. In the early 2000s, facing difficulties to obtain the entire fund dedicated to PESP from the Ministry of Economy and without obtaining expected fund from carbon market, negotiations between FONAFIFO and World Bank and GEF begun to raise funding sources. As a donor, according to their agenda, the World Bank and the GEF pushed toward a higher concern toward poverty reduction and environmental efficiency. In 2002, a new president, Abel Pacheco, nominate a new ministry of environment, Carlos Manuel Rodriguez. This new ministry was more sensible to environmentalists' positions and favorable to the enlargement of PESP scheme to all activities that provide ES, as well as a better targeting of payment. He put in the board of FONAFIFO, a biologist, as representative of the ministry of environment. Thirdly, the concept of PES begun to be more discussed in the international and national academic forum, as pioneer and successful experience, the PESP became the subject of many studies that analyzed the effects of PESP on poverty (ref) and that debates its efficiency, especially in term of additionality. Moreover, the evaluation of ES provided by diverse ecosystems (such as agro-forestry system or sylvo pastoral systems) were developed and begun to provide some evidence of the ES provided by non-forests ecosystems. Moreover, other studies, such as Gruas 1, evidence the zone of higher biodiversity interests, giving tools to define better targeting according to biodiversity issue.

**Figure 8 : Changes affecting the balance of power of stakeholders (1997-2010)**

	1997-2001	2002-2006	2006-2010
Forestry Stakeholders	consolidation of CCF (until 1999)	reduction of strength of CCF (separation of Junaforca, reduction of financial and technical resources) economic difficulty of local forestry organization limited leadership of ONF (lack of fund and technician)	Lack of available national Important imports of wood Reduction of reforestation rate
environmental stakeholders		entry of international donors focusing poverty and environment objectives	2006 : Change of government more climate change oriented 2007 : carbon neutrality orientation and development of ENCC* Perspective of REDD
	1998: change of government 1998: analysis of impact of management plan in OSA	2002: change of ministry of environment more oriented toward environmental and social purpose	2007: Reduction of cooperation financial supports following financial crisis
		Raise citizen environmental consciousness	
agricultural stakeholders		development of research on ES measurement, impact on poverty, efficiency	
		SAF studies	studies and mobilization of cafe sector and agricultural sector Learning process of agricultural representatives

NB : \* ENCC : *Stratégie nationale de changement climatique*  
Source : Stakeholders interviews 2009-2010.

This new configuration of the balance of power and resources between the different stakeholder's of interests' groups led to an inflexion of the PESP towards a stronger focus on environmental and social objectives to the detriment of a more productive oriented vision of the forest support. Hence, the unpopular PES modality for "forest management" and "established plantation" were abolished in 2003 and the "Agroforestry System" modality was introduced in 2003 after a campaign leaded by the representatives of small forestry (Junaforca) and of SINAC, and with the support of the minister of environment. Moreover, in



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line with the environmental vision, emphasizing biodiversity concern, supported by SINAC civil servants, GEF and environmental groups, a prioritization system was put in place to better target ES payment towards biodiversity important areas but also to areas with lower development index.

**c- Since 2006: a multi-dimension evolution reflecting changes in balance of power and research for funding opportunities**

The late evolution of PESP shows a multidirectional evolution product of a learning process of stakeholders upon SE and PSE mechanisms in interaction with national and international and a complex equilibrium of balance of power between stakeholders.

The forestry stakeholders oriented toward a more wood production vision, after a reduction of their power in the 2002-2006, have slightly recovered more resources to support their vision due to a new situation and evidences. First, the situation is drastically different than that which prevailed in the mid 1990 and that supported a conservation strategy. Whereas the deforestation rate was high and level of forest cover low in the 90s, in 2005, deforestation rate was low and the forest cover had risen to more than 50 % of the country. Although the abundance of forests, the restriction on forest exploitation led Costa Rica to import woods for industrial purpose, leading to important imports burden. Moreover in the framework of the objective of country Carbon neutrality in 2021 decided by the president Oscar Arias in 2007, the necessity to reduce carbon foot print is a new argument for productive vision of forest. By the way, a more intensive use of wood as material can be seen as a way to substitute higher carbon footprint material (as cement, or metals). With those new arguments, the PESP for forest management has been reintroduced in 2010.

On the other side, environmental influence on PESP seems to slightly fade as the support from international NGO is reducing following the financial crisis of 2007 and, as other issues have been gaining more importance in the agenda of environmentalist organizations (campaign toward the interdiction of mining of Cruzitas in 2009-2010). Nevertheless, as the environmental national mood is still gaining force in the Costa Rican population following educational campaign of the last decade, the orientation toward forest conservation still important.

The latest evolution of PESP appears as results of a learning process from various stakeholders of the pure market rhetoric of PES, and the research toward efficiency of payment following academic research and international influences, as well as funding opportunities. Hence, the opportunity of additional resources for PESP through GEF grant in the framework of Ecomercado 2 project tends to contribute to reinforce environmental orientation. As grant conditionality, it enables to differentiate payment leading enabling the creation in 2010 of a differentiated payment for conservation PES in area of high interest of biodiversity that are not included in other existing scheme of protection. In the same way, following the reform of the tax on water use, that lead to the increase of the level of tax and a channeled part 25 % of this tax to FONAFIFO for hydraulic ES, a differentiated payment has been set for conservation PES in areas of hydraulic interest. Finally, in the regeneration PES, with the possibility to access carbon fund, a differentiated payment for Kyoto eligible land has been introduced in 2010.



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## Conclusion

The analysis of the genesis and evolution of PESP shows that it is characterized by continuity and inflexions they have not been merely guided by technical logic but reflect also an evolution of balance of power between different groups of stakeholders. The PESP appears initially as a genuine original construction in a political and social context of Costa Rica of the mid-1990s led by dominant forestry stakeholders, but its evolution have been more directly influenced by a change of this balance of power, characterized by a reduction of power of the forestry stakeholders and a strengthening of power of national stakeholders oriented toward environmental and social purpose, as well as a stronger influence of international actors such as donors. As the balance between stakeholders appears as an important explicative factor of the evolution of PESP, the search for funding source to sustain the PES has been one of the driving forces of evolution of PESP and the change of balance of power between the different stakeholders. The other driving force has been the learning process of the different stakeholders: 1) the learning process of the management institution (FONAFIFO) that had developed the capacity to adapt the instrument to new constraints and opportunities arising from national situation and international opportunities, and by the way, contribute to the success and continuity of the PESP, 2) the learning process of the stakeholders representing specific interests that have developed the capacity to better manage the concept of PES to support their vision.

In opposition with a model of neutral market instrument, the PESP is an instrument responding to complex governance, where equilibrium of power among different stakeholders influences the orientation and functioning of the instrument. Hence, further evolution of PESP will then depends on the capacity of stakeholders to better manage the concept of PES and the changes in the balance of power between stakeholders in line with national and international context.

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Le programme SERENA traite des enjeux liés à l'émergence de la notion de « service environnemental » dans le domaine des politiques publiques concernant le milieu rural. Cette notion prend en compte non seulement la fonction productive des écosystèmes à travers l'agriculture, traditionnellement appréhendée par les politiques agricoles, mais aussi d'autres fonctions : régulation, culturelles...

L'objectif du programme SERENA est d'identifier les principes, les mécanismes et les instruments qui facilitent la prise en compte de la notion de service environnemental dans les nouveaux dispositifs d'action publique en milieu rural. Il s'agira de mieux comprendre les recompositions des politiques publiques et d'être en mesure d'élaborer des recommandations pratiques pour en améliorer la mise en œuvre.

Le programme SERENA, d'une durée de 4 ans (2009-2012), repose sur une analyse comparative internationale (France, Costa-Rica et Madagascar) et mobilise environ 40 scientifiques, essentiellement de sciences sociales, issus d'organismes de recherche français (IRD, CIRAD, CEMAGREF, CNRS, ENGREF, Université de Montpellier 3, Université de Versailles St Quentin en Yvelines, ENITAC, INRA...).

Les produits du programme SERENA (publications, guides opérationnels, CD Rom, site internet) seront déclinés pour deux publics principaux : la communauté scientifique et la communauté des acteurs impliqués dans les politiques environnementales et rurales (décideurs, experts, responsables d'organisations de la société civile et du secteur privé...).

*The SERENA programme deals with issues linked to the emergence of the concept of environmental service in rural public policies. In this context, ecosystems managed by agriculture are not only analysed from a traditional productive function perspective but also for their regulatory, cultural functions, and thus for the services linked to the maintenance of habitats, biodiversity and landscape.*

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*The SERENA programme runs for a period of four years (2009-2012), to carry out an international comparative analysis (France, Costa Rica and Madagascar). The scientific research team consists of about 40 scientists mainly from social sciences, and from various French research institutes (IRD, CIRAD, CNRS, ENGREF, CEMAGREF, University of Montpellier 3, University of Versailles Saint Quentin en Yvelines, ENITAC, INRA...).*

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